ALAMEDA SONG SPARROW (*Melospiza melodia pusillula*)

Yvonne Chan, Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, CA 94970 (22 Bernard Street, Mill Valley, CA 94941); yvonchan@stanford.edu.

Criteria Scores

Population Trend	Range Trend	Population Size	Range Size	Endemism	Population Concentration	Threats
20	10	5	10	10	5	10

Special Concern Priority

The Alameda song sparrow is currently considered a Bird Species of Special Concern (year-round), Priority 1. No subspecies were included on the original list (Remsen 1978), and this subspecies was included on CDFG's (1992) list.

Breeding Bird Survey Statistics for California

No data reported at the subspecies level (Sauer et al. 2000).

General Range and Abundance

The Alameda song sparrow is endemic to California. Its year-round range is confined to tidal salt marsh habitat located on the fringes of the south arm of San Francisco Bay starting from El Cerrito to the east and San Francisco to the west (Grinnell & Miller, 1944). The largest concentrations of the Alameda song sparrow probably occur in the tidal salt marshes near Dumbarton Point (PRBO unpub. data).

The distinctness of the Alameda song sparrow has been noted by researchers based on morphology, plumage, and genetics (Marshall 1948b, Ridgeway 1899, Aldrich, 1984, Chan and Arcese *in press*). The song sparrows found in the tidal marshes of San Francisco Bay are the smallest in wing and tarsus measurements among all song sparrow subspecies (Aldrich, 1984). The Alameda song sparrow is the only song sparrow subspecies with a yellowish wash to the belly (Marshall 1948b, Ridgeway 1899). A multivariate analysis of morphological measurements confirmed their distinctness assigning 87% of individuals correctly to the Alameda song sparrow

(Chan, 2000). Finally, a genetic analysis of microsatellite allele frequencies found the Alameda song sparrow to be the most genetically divergent among all song sparrow subspecies in the San Francisco Bay region and statistically significant differences in allele frequencies were found between the Alameda song sparrow and all other subspecies in the San Francisco Bay region (Chan and Arcese *in press*).

Seasonal Status in California

Occurs year round; breeding season extends from early March to late July.

Historical Range and Abundance in California

Grinnell and Miller (1944) describe the Alameda song sparrow as an "abundant" resident of salt marshes along the edge of San Francisco Bay extending from the city of San Francisco, south to Palo Alto and Alviso, Santa Clara County, and along the eastern edge of the bay to the south of El Cerrito, Contra Costa County. The Alameda song sparrow was likely found historically where tidal marsh habitat was available in South San Francisco Bay. One estimate of historic tidal marsh habitat for the Alameda song sparrow in the 1850's is 102.8 square miles (266.3 square kilometers; Marshall & Dedrick, 1994), which represented extensive continuous tidal marsh habitat from the area near Alameda, south to Alviso, and south of San Mateo (see Marshall and Dedrick 1994 for maps).

Historic locations of confirmed breeding include the mouth of San Francisquito Creek, Palo Alto (Grinnell 1901).

Recent Range and Abundance in California

Tidal marsh habitat along the northern edge of the breeding range of the Alameda song sparrow has been severely reduced (Marshall & Dedrick, 1994), probably resulting in a reduction of the outline of the breeding range from its historical extent. Additionally, the loss of historic tidal marsh habitat within its range has probably resulted in the loss of song sparrow populations. The current extent of tidal marsh habitat, 10.4 square miles (27.0 square kilometers) represents a decrease of 90% from

historical estimates (Marshall and Dedrick 1994). Reduction in habitat has occurred most severely between the San Mateo and Dumbarton Bridges and on the east side of San Francisco Bay from Richmond south to Hayward (Walton, 1978). Current range of the Alameda song sparrow is therefore confined to the remaining isolated marsh fragments (Dumbarton Marsh, Palo Alto Baylands, Hayward Regional Shoreline) and marsh vegetation along sloughs, dikes, and levees (PRBO unpub. data; Delisle 1966 in Walton 1978).

The Alameda song sparrow lives at high densities averaging 16 birds per hectare in large areas of tidal salt marsh such as Dumbarton Marsh (PRBO unpub. data). These estimates are similar to densities observed for San Pablo and Suisun Song Sparrows. However, across its breeding range, mean density is 5.2 birds per hectare (Nur et al. 2001). Song sparrow abundance has been positively correlated with an increase in the size of the marsh fragment and negatively correlated with increased isolation of marsh. An increase in urban area adjacent to the marsh habitat also has a negative influence on population density (Stralberg et al, 2001). Estimates of total breeding population size range from 11,300 to 15,200 (Marshall and Dedrick 1994, PRBO unpub. data).

Ecological Requirements

Marshall (1948a) described the ecological requirements of the song sparrow subspecies that inhabit the tidal salt marshes surrounding San Francisco Bay. The Alameda song sparrow inhabits tidal salt marshes that have an appropriate configuration of vegetation, water, and exposed ground (Marshall 1948a). Vegetation is required for nesting sites, song perches, and cover for hiding. In particular, the height of the vegetation may be limiting for song sparrows (Marshall 1948). The dominant plants of tidal salt marshes in San Francisco Bay are *Spartina sp.* in low elevations of the marsh, *Salicornia sp.* on slightly higher ground, and *Grindelia sp.* on higher ground along slough edges. Marshall (1948a) noted that song sparrows were either absent or less dense when *Spartina* was less than 18 inches high and song sparrows were missing from areas of *Salicornia* that were less than 12

inches high. Song sparrow abundance is also positively related to the proportion of shrub cover (PRBO unpub. data).

The appropriate configuration of water for tidal marsh song sparrows is habitat that is tidally influenced. Where the marsh plain is intersected by sloughs song sparrow territories are lined single file along the slough providing each pair with access to the slough and its overhanging banks for food and cover. In marshes where there are no sloughs, a tidal influence is still required, and in areas that are diked and the water is stagnant, few song sparrows are found (Marshall 1948a).

Finally, exposed ground for foraging has been noted as a requirement. In tidal salt marshes, dense *Salicornia* is opened by small mammal trails and tidal action. Marshall notes that the densest vegetation within which song sparrows can exist is *Scirpus* species whose base grows at least 1-2 inches apart, providing openings for foraging on the ground.

The Alameda song sparrow may be particularly suited to the highly saline marshes of the southern arm of San Francisco Bay. In their study of salt tolerance in song sparrows, Basham and Mewadlt (1987) found that Alameda song sparrows were able to maintain their body weight under saline conditions, while song sparrows of the neighboring subspecies, the Santa Cruz song sparrow, could not.

Studies of population limiting factors of the Alameda song sparrow have cited available tidal salt marsh habitat as the limiting factor (Marshall and Dedrick 1994, Walton 1978). Available habitat has been reduced to 10-25 % of historical estimates. This translates to a presumed reduction in population size of 75-90 % (Marshall and Dedrick 1994, Walton 1978). Birds in the remaining tidal marsh habitat, which is now fragmented within a mostly urban matrix, may suffer increased predation from domestic cats and Norway rats (Walton 1978). Additionally, inability to disperse may limit individual population recovery from disasters and disease. PRBO is currently exploring the effects of fragmentation on Alameda song sparrow abundance, in terms of size and configuration of habitat patches at the landscape scale. Although tidal marsh song sparrow

abundance is negatively related to the proportion of urbanization in the surrounding landscape, abundance appears to be higher on habitat edges (PRBO unpub. data).

Threats

Habitat loss and degradation may be the primary threats to the Alameda song sparrow. Alteration of the tidal marsh habitat due to invasive species of *Spartina* and *Lepidium* may also have adverse effects. Another major threat may be changes in salinity of the salt marshes due to freshwater run-off from adjacent urban areas such as San Jose (Basham and Medwalt 1987, Marshall and Dedrick 1994). The decrease in salinity may increase the likelihood of interbreeding with neighboring song sparrow subspecies by enabling access to tidal salt marshes where previously the salinity was not tolerable to the neighboring song sparrow subspecies. The Alameda song sparrow is genetically the most distinct subspecies of song sparrow in the San Francisco Bay region (Chan and Arcese *in press*). Reproductive failure caused by high levels of nest predation may also have a significant impact.

Management and Research Recommendations

- Protect and restore tidal salt marshes in South San Francisco Bay. In particular, large continuous populations such as Dumbarton Marsh should be given high priority, as well as restoration of large areas such a Bair Island.
- Research the impact of invasive exotic plant species to the tidal salt marsh habitat and their impacts on song sparrow population density and reproductive success.
- Document changes in vegetation and habitat where changes in salinity due to urban run-off have occurred and monitor the subspecific integrity of populations that may be threatened by introgression.

- Conduct research to identify habitat requirements and ecological conditions that support self-sustaining populations, with particular attention paid to ideal restoration of tidal marsh habitat and the importance of landscape factors.

Monitoring Needs

The Breeding Bird Survey is inadequate for monitoring changes in the population dynamics of this subspecies. The Alameda song sparrow is restricted to tidal salt marshes, which are not accessible and ineffectively surveyed from roads. Standardized point counts within the tidal marsh habitat could provide an index of breeding population size. Breeding productivity could be estimated by establishing nest plots within the tidal marsh habitat. It in unlikely that constant effort mist-netting would be an effective unbiased estimate of survival and productivity in the tidal marsh habitat due to the openness of the habitat.

Acknowledgments

This account benefited from reviews by Hildie Spautz and Nadav Nur.

Literature Cited

Aldrich, J. W. 1984. Ecogeographic variation in size and proportions on song sparrows *(Melospiza melodia)*. American Ornithologists' Union, Washington DC.

Basham, M. P., and Mewaldt, L. R. 1987. Salt water tolerance and the distribution of south San Francisco Bay Song Sparrows. Condor 89:697-709.

Chan, Y. and Arcese, P. (In press) Subspecific differentiation and conservation of Song Sparrows (*Melospiza melodia*) in the San Francisco Bay region inferred by microsatellite loci analysis. Auk.

Chan, Y. 2000. Population differentiation and conservation of song sparrows (*Melospiza melodia*) in the San Francisco Bay region inferred by morphological and microsatellite loci analysis. M.S. Thesis. Department of Forestry. University of British Columbia, Vancouver, BC.

Grinnell, J. 1901. The Santa Cruz song sparrow, with notes on the salt marsh song sparrow. Condor 3: 92-93.

Grinnell, J. and Miller, A. H. 1944. The Distribution of the Birds of California. Artemesia Press, Lee Vining.

Marshall, J. T. J. 1948a. Ecologic races of song sparrows in the San Francisco Bay region. Part I. Habitat and abundance. Condor 50: 193-215.

Marshall, J. T. J. 1948b. Ecologic races of song sparrows in the San Francisco Bay region. Part II. Geographic variation. Condor 50: 233-256.

Marshall, J. T. & Dedrick, K. G. 1994. Endemic song sparrows and yellowthroats of San Francisco Bay. Studies Avian Biol. **15**: 316-327.

Nur, N. , Spautz, H., Chan, Y., Wood, J. and Stralber, D. 2001. Conservation biology of tidal marsh-dependent songbirds in the San Francisco Estuary: Status, trends, distribution, and abundance in relation to significant habitat features. Poster presented at the State of the Estuary Conference, San Francisco, CA.

Remsen, J. V. 1978. Bird species of special concern in California: An annotated list of declining or vulnerable bird species. Nongame Wildl. Invest., Wildl. Mgmt. Branch Admin. Rept. 78-1. Calif. Dept. Fish & Game, 1416 Ninth St. Sacramento, CA 95814.

Ridgeway, R. 1899. New species of American Birds. - iii. Fringillidae (continued). Auk 16:35-37.

Sauer, J. R., Hines, J. E., Thomas, I., Fallon, J., and Gough, G. 2000. The North American Breeding Bird Survey, results and analysis 1966-1999. Version 98.1, USGS Patuxent Wildl. Res. Ctr., Laurel MD (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Stralberg, D., Nur, N., and Spautz, H. 2001. Landscape-level predictors of songbird abundance in San Francisco Bay tidal marshes. Poster presented at the State of the Estuary Conference. San Francisco, CA.

Walton, B. J. 1978. The status of the salt marsh song sparrows of the San Francisco Bay System, 1974-1976. M.S. Thesis. Department of Biological Sciences. San Jose State University, San Jose, CA.